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Postilla Number 178
30 November 1979

A Revision of the Genus *Metaxaglaea* (Lepidoptera: Noctuidae, Cuculliinae) with Descriptions of Two New Species

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(Received 21 November 1978)

Abstract

Two new species, *Metaxaglaea violacea* and *M. australis,* are described and figured from southeastern North America. Distributions and life histories, including figures of the larvae, are given for all species in the genus. Eggs of four species are also figured.

The larva of *M. violacea* differs strikingly from that of other species of this or any related genus, although the adults can be reliably distinguished from *M. viatica* only by color. *M. australis* is at best only statistically separable from *M. semitaria* on the basis of male genitalia but differs markedly in egg characters as well as exhibiting subtle differences in adult maculation and at least one distinctive larval character.

Certain characters of the male genitalia are markedly variable in *M. viatica* and *M. violacea*. In particular, the presence or absence of certain spines on the valves is variable within all populations studied.

Every species of the genus occurs in partial sympatry with at least three congeners, but no single locality is known to have all of the five species. Flight seasons of all species overlap broadly in any given locality. There appears to be essentially complete separation of larval feeding niches, although the natural foodplants of *M. australis* are not yet known.

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Introduction

The primary purpose of this paper is to validate names for two new species of *Metaxaglaea,* one of which I have used extensively in recent ecological investigations whose results are to be published soon. Keys to the adults and last instar larvae are included. Discussions and data concerning intraspecific variation in certain structures on the male valves are presented.

Summaries of the distributions, hostplants, and other information for the remaining Lithophanini of eastern North America can be found in Schweitzer (1974, 1977), and several of the larvae were described briefly by Forbes (1954) and in more detail by Crumb (1956). Except for *Metaxaglaea* and the *Eupsilia cirripalea-sidus* complex, adults should be identifiable with the keys and descriptions of Forbes (1954).

Collections Consulted and Identifying Abbreviations

The following collections were examined or specimens were borrowed from them, and records from each are included in this study:

The American Museum of Natural History, New York City, New York (AMNH)

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Florida Department of Plant Industry, Gainesville, Florida (DPI)
Museum of Comparative Zoology, Harvard University, Cambridge Massachusetts (MCZ)
Peabody Museum of Natural History, Yale University, New Haven, Connecticut (YPM)
Wedge Collection, McClellanville, South Carolina (WC)
H.D. Baggett, Jacksonville, Florida (HDB)
Charles V. Covell, Jr., University of Louisville, Kentucky (CVC)
John W. Cadbury, III, Browns Mills, New Jersey (JWC)
John G. Franclemont, Cornell University, Ithaca, New York (JGF)
J. Richard Heitzman, Independence, Missouri (JRH)
Charles P. Kimball, West Barnstable, Massachusetts (CPK)
Bryant Mather, Clinton, Mississippi (BM)
Joseph Muller, Lebanon, New Jersey (JM)
Eric L. Quinter, New York City, New York (ELQ)
Dale F. Schweitzer, New Haven, Connecticut (DFS)
John Bolling Sullivan, Beaufort, North Carolina (JBS)
C. Brooke Worth, Delmont, New Jersey (CBW)
William D. Winter, Dedham Massachusetts (WDW)

Genus *Metaxaglaea* Franclemont, 1937
Can. Entomol. 69: 129
Genotype *Orthosia viatica* Grote

Superficially the species of *Metaxaglaea* are separable from related genera by their larger size (except that *Epiglaea decliva* Grote is as large), their much weaker or absent central ridge on the thoracic scaling [except *Sericaglaea signata* (French) is similar] and the combination of the general course and dentation [except in *M. inulta* (Grote)] of the postmedian line on the forewing. The postmedian lines of *S. signata* and *E. decliva* are similarly toothed, but extend farther basally at the costa.

The male genitalia of all *Metaxaglaea* are distinctive in the presence of a well-developed corona, a vestigial clasper, and a terminal spine, and in the lack of a normally formed digitus. Larvae of *Chaetaglaea, Epiglaea* and *Sericaglaea* are similar to those of the normal *Metaxaglaea* (but not to *M. violacea* n. sp.) and can be separated by the characters given for the various species by Crumb (1956), Forbes (1954), and in this paper. There seem to be no closely related genera outside of eastern North America.

Adults of *Metaxaglaea* emerge in the autumn and mate a few weeks later. Oviposition is mostly in the autumn or winter as in closely related genera, except for *Sericaglaea* in which reproduction is delayed until late winter or spring. Eggs hatch in the winter or early spring and larvae mature in late spring and aestivate in a subterranean cocoon until late summer or autumn when they pupate. All species of this and related genera are strictly univoltine. Their ecology has been discussed at length by Schweitzer (1977, 1979).

Metaxaglaea semitaria Franclemont, 1968.

Glaea viatica, Holland, 1903, Moth Book: pl. 26, fig. 38 (not Grote: misidentification).

Conistra viatica, Hampson, 1906, Catalogue Lepidoptera Phalaenae British Museum 6: 461 (in part).

Metaxaglaea viatica, Forbes and Franclemont, 1954 *in* Forbes, Lepid. New York & Neighboring States, Part 3, Cornell Univ. Agric. Exper. Sta. Mem. 329: 152 (in part).

Metaxaglaea semitaria Franclemont, 1968, Entomol. News 79: 57-63.

This species is very close to *M. australis* n. sp. in the imaginal stage but differs as indicated in

the key. For other differences in imagines, eggs and larvae, see *M. australis* and the imaginal and larval keys.

Distribution

This species ranges widely east of the Appalachians. Its western limits are unknown. The type locality is Arlington, VIRGINIA. Brower's (1974) reports of *viatica* in MAINE presumably represent primarily this and the MCZ has it from Kittery Point (but see also *viatica).* Jones and Kimball's (1943) report from Martha's Vineyard, MASSACHUSETTS, represents this (specimens at YPM). Franclemont also had paratypes from Hampton, NEW HAMPSHIRE.

In addition to the above records I have examined specimens from: MASSACHUSETTS: the Cape Cod-Plymouth region (AMNH, DFS, CPK); Westwood, Middlesex Co. (WDW); Leverett, Franklin Co.; and Sturbridge, Worcester Co. (DFS); CONNECTICUT: Mansfield, Tolland Co.; Mystic, New London Co.; Washington, Litchfield Co.; and four localities in New Haven Co. (DFS, YPM); PENNSYLVANIA, local: the barrens at Nottingham, Chester Co. (DFS); at least two places near Auburn, Schuylkill Co. (ELQ); and probably Bucks ("Newportville" — ELQ) Co.; NEW YORK: Valley Cottage, Rockland Co.; Horseheads and Long Island (JGF, YPM); NEW JERSEY: all of the Pine Barrens region: Monmouth to Cape May counties, and in parts of the Barrens it is one of the most abundant of all Noctuidae at bait some years; NORTH CAROLINA: Carteret Co. (JBS); SOUTH CAROLINA; Florence, Florence Co. (DFS); McClellanville, Charleston Co. (WC); and Clemson, Oconee Co. (DFS); FLORIDA: Jacksonville, Duval Co. (DFS, HDB); MISSISSIPPI: Pearl, Rankin Co. (BM); KENTUCKY: Pine Mountain State Park, Bell Co. (CVC, DFS). Kentucky specimens are mostly large with the dark markings weak and the ground very bright and unusually orangish, but are certainly conspecific.

Early Stages

The larva, as illustrated here (Fig. 19), is similar to that of *M. inulta, M. viatica* and the new species to be described below. A life history follows, based on several New Jersey, Connecticut, and South Carolina (Clemson) broods.

Egg

(Fig. 24) Larger than any other *Metaxaglaea* except *M. inulta*. Becomes completely dark gray soon after oviposition. About 0.8 mm basal diameter.

Larva

First instar Dark brown, lines pale, whitish; tubercles darker brown, smaller than in *viatica*. Head dark brown. About 3 mm when hatched.

Second instar Body dorsally rather smooth reddish brown or dark purple, tubercles small, darker. Dorsal, subdorsal and lateral lines white, strong. Spiracular line enclosing lower half of spiracles; white, edged above with dark brown. Venter pale, dull brownish. Head, cervical shield, true legs shiny brown.

Third instar Similar to second instar, often more reddish in life. All lines except spiracular less distinct. Dorsal edged with broken brown shade on each side. Tubercles indistinct.

Fourth instar Similar to third instar but less reddish and with subdorsal and lateral lines not traceable at low magnification. Abdominal segments with darker anteriorly opening V-marks arising from dark intersegmental patches.

Fifth instar Medium brown with pale venter and lateral area darkest; pattern as in fourth instar.

Sixth, last, instar Fig. 19. Ground pale brown, with darker mottling, may be somewhat reddish. Dorsal line strong, broken, of ground color, with brown edging. Spiracular line sometimes nearly lost in paler ventral color,

when strong, with lower edges diffuse; dark brown upper edging fragmented, variable in amount, almost always discontinuous, never prominent, often absent. Head shiny, about color of body. Dorsum with dark mottling tending to form anteriorly opening V-marks on abdominal segments of most individuals. Tubercles minute, dark with pale ring. At full growth, about 35–40 mm.

Foodplants and Notes

In captivity, larvae ate many deciduous woody species, but grew poorly or not at all except on blueberries (*Vaccinium* sp.), oaks, crabapples (*Pyrus* spp.) and a wild white rose (*Rosa* sp.). On the *Rosa* sp., sleeved larvae perished in the third instar. They can be reared (with high mortality) to the last instar on oaks (*Quercus rubra* L. and *Q. palustris* Muench) in the laboratory, but when sleeved on these they rarely reached that instar. In either case, less than 1% reached aestivation on oak. I was more successful when starting a brood on foliage of crabapples and changing the diet to oaks as soon as these began to put out growth. When feeding on oaks the larvae strongly prefer the aments.

In the field, the larva is almost certainly a *Vaccinium* feeder, at least in the early instars. Eggs hatched in a shaded shelter at ambient temperatures from January to April, mostly in March (Connecticut), except that a few laid very late in autumn hatched as late as early May. During winter conditions *Vaccinium* flower buds are readily eaten but *Quercus* (5 spp.), *Pinus* spp., *Chamaecyparis*, *Gaylussacia* spp., *Leucothoe racemosa* (L.) Gray, *Magnolia virginiana* L., and lichens are all unacceptable.

When sleeved in late February 1976 on *V. corymbosum* L. larvae reached the third instar before the buds opened in April (Connecticut). I have also sleeved them on winter *V. vacillans* Kalm upon which growth is good but not as fast as on *V. corymbosum*, perhaps because the flower buds are smaller on the former species and difficult to locate. *V. atrococcum* (Gray) Heller is also an excellent host for sleeved larvae, but larvae could not be reared to maturity in the laboratory on the cuttings. Survival to imago is very high for sleeved larvae on all three species.

First instar larvae can readily withstand extreme cold (+7°F = −14°C) but cannot survive ice formation on their bodies. They feed diurnally in cool weather, nocturnally indoors. In cold weather they leave the food to seek shelter, but under warm conditions they remain on the buds when resting. They occasionally bore into the buds but usually eat the outer tissues.

The moth occurs, often abundantly, on open to brushy barrens, in young oak woods on sandy soils, and in acid swamps and bogs. Thus it is likely that several blueberries serve as natural hosts. Larvae can successfully change to a diet of oaks, at least for their last three instars, and probably often do so in nature.

Seasons

Mostly earlier than *M. viatica* and *M. violacea*, declining sharply about 10 November most years in southern New Jersey where it comes abundantly to bait from early October to early November. Extreme dates there are 23 September to 20 December (based on around 1000 field observations and specimens). However, only two December captures are known. Dates in South Carolina (McClellanville) are 6 November to 15 December based on six specimens in the Wedge Collection. However, I collected a very worn female there on 23 February 1977 (YPM). The Mississippi date is 26 December 1970, 1♀. The Florida specimens were both taken 22 November 1978.

The first new species has been confused with *Metaxaglaea viatica* (Grote) and more recently has been determined by myself, Dr. John G.

Franclemont, and possibly others, as *M. semitaria* Franclemont. It is included with that species by Schweitzer (1977), and Kimball (1965) probably figured this new species as *M. viatica.*

It is very close to *M. semitaria*, but the differences in the egg, larva and in hostplant acceptability cause me to consider it as a distinct species rather than a subspecies of *M. semitaria*. Also the two are sympatric near McClellanville, South Carolina, and at Jacksonville, Florida, and appear to have different but overlapping flight periods. While it is possible that hybrids would be unrecognizable, I have no evidence of their occurrence.

Metaxaglaea australis, new species

Head and thorax chestnut brown to leather brown. Antennae with scape white, basal quarter also white on outer surface, otherwise chestnut brown. Thorax usually with two small blackish spots behind collar.

Forewings either leather brown (very close to many *M. viatica*) or dark dusky brown. Area beyond postmedian line, and sometimes area before antemedian line, darker. Basal line double, elements dark brown, traceable only near costa or obsolete. Antemedian line usually fully traceable but seldom conspicuous; dark brown, double with paler filling; general course variable, wavy but usually less so than in *M. semitaria*. Median shade diffuse, dark brown, angulate at and passing through lower part of reniform; usually fully traceable but sometimes lost toward costa. Postmedian line double, fully traceable, dark brown, outcurved but generally straighter than in *M. semitaria*; regularly and deeply dentate, with teeth terminating outwardly in darker brown or black dots. Orbicular and reniform large, defined by a dark outer and pale inner ring with the filling of the ground color, or darker. Reniform kidney-shaped; orbicular variable, more or less oval. Subterminal line somewhat curved, mostly parallel to outer margin but inset sharply below costa to vein R_5: dark brown followed immediately by a conspicuous pale shade, like related species. Area beyond subterminal line often somewhat grayish. Terminal line dark brown, regularly toothed. Fringes grayish. Veins Cu and Cu_2 usually partially white.

Hindwing fuscous, paler than in *M. semitaria*, sometimes with dark discal spot and sometimes with some indication of postmedian and subterminal lines. Terminal line dark brown, much more contrasting than in *M. semitaria*. Fringes light brown.

Wings beneath grayish with some chestnut tint along costae and outer margins. Forewing disk blackish. Postmedian line blackish, slightly waved, continued on hindwing but often incomplete. Forewing sometimes with some indication of the reniform, hindwing with dark discal spot.

Abdomen with a variable mixture of chestnut, gray, and black scales, chestnut predominating ventrally. Legs with femora clothed with long brown hairs and tibiae and tarsi white. Thorax ventrally covered by a mixture of gray and chestnut scales, and with a blackish shade from behind the head narrowing to a line along the wing bases. This shade more massive than the usual small triangle of *M. semitaria*.

Forewing length About 18 – 21 mm (except reared dwarfs).

Male genitalia as figured (Figs. 31 – 32), very similar to *M. semitaria* as illustrated by Franclemont (1968). The right valve perhaps narrower and with the bulge opposite the corona on that valve averaging more pronounced. The indentation at the top of the juxta is often very shallow, but both species are quite variable in this trait and the difference is at best statistical.

In a blind procedure, in which a colleague had cross-numbered male genitalia and moths so that I did not know which moth the genitalia were from, I was able to sort properly ten of 13 *M. semitaria* and nine of 11 *M. australis*. These

results were analyzed by a chi-square goodness of fit test (df = 3): $\chi^2 = 8.2$; $p < 0.05$. Thus, the association between the superficial characters I have given for these two species and the bulge character is not random. However, this character does not seem to offer a safe method of recognition. A very similar procedure was used recently (Gall, 1976) to investigate the status of a lycaenid, and I recommend it as a very useful one.

Female genitalia Not differing consistently from other *Metaxaglaea* species. Most or all specimens have the left lateral signa extending about as far anteriorly on the bursa copulatrix as the median signae. This lateral signa is often shorter in *M. semitaria,* although not usually as short as on the specimen illustrated by Franclemont (1968).

Diagnosis, imago

M. australis (Figs. 1–6) is separable from *M. viatica* (Figs. 9–11) by the smaller size, the male genitalia, the more dentate terminal line on the hindwing, frequently by a duller or much darker forewing color and by the somewhat broader forewings. Some specimens are superficially indistinguishable to my eye, except by size.

M. semitaria (Fig. 7) is most easily separable from *M. australis* by its larger size and generally brighter forewings which are often somewhat yellowish or orangish. The forewings of *M. australis* are usually more coarsely powdered in the median area. The terminal line on the hindwing is much more conspicuous on *M. australis* than on *M. semitaria*. Both wings, especially of females, are often much broader in *M. australis*.

The forewing color of fresh pale *M. australis* approaches Hazel of Ridgway (1913), approximately SO-7°-9 of Villalobos and Villalobos (1947). Dark specimens approach Ridgway's Liver Brown or Mars Brown, but are slightly grayer, or roughly SO-2°-5 of Villalobos and Villalobos. More average specimens approach such shades as Chestnut and Kaiser Brown of Ridgway and most seem to fit between SO-5° to 7°-6 to 8 of Villalobos and Villalobos. Most *M. semitaria* approach Cinnamon-Rufous, Tawny and Ochreous—Tawny of Ridgway, approximately OOS-12°-11 or 0-12°-10 of Villalobos and Villalobos.

Probably the surest way to separate this species from *M. semitaria* when good series of both are not available would be to obtain eggs and allow these to develop indoors for several days and compare with the description and figures given below. Mated females will oviposit freely on papers towels, although they usually have to be fed. Careful dissection of females and measurement of the basal diameter of their eggs might also be a useful technique.

Early Stages

Egg

As figured (Fig. 25 a,b): much like *M. viatica, violacea* n. sp., and *inulta*. The pattern may be either gray or dark brown as in at least *M. viatica* and M. violacea (Figs. 26, 27) and is variable in all four species. Eggs of *M. semitaria* (Fig. 24) are larger in basal diameter (0.8 mm) than *M. australis* (0.5 mm) or other congeners except *M. inulta*. Furthermore, *M. semitaria* eggs become solidly dark gray within a few days after oviposition and in only one of about 40 clutches seen was any color pattern visible.

Larva

First instar Dark gray. Tubercles small (about like *M. semitaria),* darker. Some indication of a pale spiracular line. Venter paler.

Second instar Dorsum to spiracular line gray with some purple tint and sometimes mottled with white. Tubercles and setae black. Dorsal, subdorsal, and lateral lines white, the lateral broken. Spiracular line touching only bottoms of spiracles, white variably shaded with pinkish and edged above with variable amounts of dark brown, sometimes with entire area between lateral and spiracular line dark. Cervical shield brownish, lines white. Head

brownish gray with dark brown or black markings. Venter pale gray. Spiracles dark brown or black.

Third instar Dorsum grayish brown heavily mottled in white, especially middorsally. Tubercles moderately conspicuous (more so than in *M. semitaria),* black. Dorsal line strong, white, interrupted between segments; subdorsal and lateral lines also white, but weak and fragmented. Spiracular line white with definite pinkish tint, conspicuously edged above with dark brown. Cervical shield as before, head now marked with brown. Venter dirty gray. Spiracles black.

Fourth instar Middorsal area pale whitish brown with yellow shades, sides very dark brown mottled with white. Dorsal area with dark anteriorly opening V-marks at least on the abdominal segments. Dorsal line cream, broken between segments and outlined in black which tends to form patches at intersegmental regions. Subdorsal and lateral lines white, fragmented. Stigmatal band cream white with definite pink and yellow areas, edged above with black, especially on abdominal segments. Cervical shield and head not contrasting with body. Venter gray.

Fifth instar Body above spiracular line brownish, appearing nearly even to naked eye, middorsum much paler, dark anteriorly opening V-marks conspicuous on abdominal segments. Dorsal line yellowish. Tubercles minute, dark, accompanied by a pale shade which is often visible on thorax without magnification. Spiracular band whitish, strong, edged above by sharply defined dark brown line. Head and cervical shield dark brown, venter paler mottled with gray and white. To 22 mm.

Sixth, last, instar Figs. 16–18. Ground laterally brownish, variably mottled with dusky gray, or less often dark brown, which fades out somewhat at maturity. Dorsum paler, rather tawny, sometimes distinctly yellowish. V-markings inconspicuous but sometimes also with a posteriorly opening set, giving a diamond pattern. Dorsal line yellowish, essentially continuous. Spiracular line touching lower edge of spiracles, whitish, always edged above with some dark brown or black, usually a continuous line. Spiracles black. Tubercles minute, black, sometimes (varies within broods) set in a small white patch which is often conspicuous on thoracic segments. Head and cervical shield dark brown. Venter pale, mottled with white and gray, much more so than *M. semitaria.* To about 35–40 mm.

Besides those characters given in the key, larvae of this species differ from *M. semitaria* in various color shades, most notably the dusky gray, rather than brown, mottling of the dorsal region, the presence of pink and yellowish tints in the stigmatal line and the lack of reddish tint dorsally in the last three larval instars. *M. viatica* larvae do not have any yellow tints and they are suffused dorsally with dark brown rather than the usual dusky gray of *M. australis.* The larva described by Hampson (1906) as *Conistra viatica* may be that of *M. australis* as discussed below under *M. viatica.* It ate mostly oak.

Foodplants and Notes

The larvae accepted a wide array of plants but were promptly poisoned by several including *Liquidambar styraciflua* L., *Magnolia* sp., *Pyrus* (*Malus*) ×*purpurea* Hort. Barbier and a horticultural cherry (*Prunus*). They failed to grow well on several others such as privet (*Ligustrum*), certain *Pyrus* (*Malus*) spp., and *Fraxinus* sp. Plants which seemed to support good growth were several oaks (*Quercus bicolor* Willd., *Q. ilicifolia* Wang and *Q. palustris*), *Vaccinium atrococcum, Prunus serotina,* a white flowered crabapple [*Pyrus* (*Malus*) sp.] and a shrubby *Lonicera* sp., although larvae were not maintained on the *Lonicera*, *Q. ilicifolia* or *bicolor* for long. *Pinus* spp. and *Pieris japonica* blossoms were rejected. Of the accepted genera only species of *Quercus* seemed abundant at the type locality.

Survival was low when newly hatched larvae were sleeved on any of the above, with death usually occurring from the third to last instar.

However, when started early indoors and placed out as third instars on newly opened buds (aments in the case of *Quercus*) they did quite well on the plants indicated. The best rearing strategy seems to be to start the larvae indoors for three instars on an early leafing plant like *Prunus serotina* and then transfer them to sleeves on *Quercus* aments or young *Vaccinium* or *Prunus* leaves. If larvae weaken late in the last instar this is due to overly mature food and they should be transferred to young *P. serotina* (not *Quercus*) shoots or new terminal twigs. Apparently sleeved larvae cannot grow fast enough to maintain suitable synchrony with host's development in northern climates. This is the only *Metaxaglaea* (of four tried) that I have been able to rear on an artificial diet (modified "*Manduca* diet" without nicotinic acid), but survival was poor and moths were dwarfed.

The foodplants are not known in the field, but the winter oviposition season suggests an evergreen, since locating specific deciduous hosts would presumably be difficult at that season. I suspect *Quercus virginiana* Mill. is the food at the type locality. However, several other oaks retain some living leaves through the winter there and might therefore be utilized for oviposition. Perhaps this species is polyphagous, but its very limited distribution suggests it is not. It is possible though that this species differs greatly from other *Metaxaglaea* (and nearly all other Lithophanini) in its climatic tolerances. However, eggs can survive cold northern winters. Eggs from three females were kept outside in Connecticut during the extremely cold winter of 1977–78. All lots were 85–100 eggs and hatching success was over 90% for one lot although less than 10% for the others. Refrigerated eggs all failed to hatch even though moist paper towel was provided to prevent desiccation.

Reared females, caged outdoors in Connecticut in October and November 1977 became sexually receptive in about two or three weeks after eclosion as is typical for other *Metaxaglaea*. However, all three that were retained for eggs soon began sending pheromones again after laying about 80 to 150 fertile eggs. Although additional males were not provided, females continued to lay fertile eggs. Two wild females from the type locality, taken 23 February 1977, contained four and six spermatophores (Paratypes 92 and 93). All of 47 mated New Jersey *M. semitaria* females dissected contained only one. Northward, very late *M. viatica* and *M. violacea* generally contain two (Schweitzer, 1977).

Type Material

The present or intended deposition of specimens is noted in parentheses. Abbreviations are explained under Collections Consulted (above).

HOLOTYPE Fig. 1. Male, first label "Reared *ex ovo* from Paratype no. 81 taken: S.C.: Charleston Co., 7 mi. NE McClellanville, larva April–May 1977, eclosed 15 October 1977 *leg.* Dale F. Schweitzer" second label "Reared on *Quercus palustris,* 1st 3 instars indoors then sleeved April-May 1977 at New Haven, Ct. ecl. outdoors" (YPM).

ALLOTYPE Fig. 2. Female, sibling to Holotype, same data, but eclosed 18 October 1977 (YPM).

The Holotype has nearly normal coloration, but faint maculation, and the Allotype is of the dark form. Both are small but within the size range of wild-caught specimens.

Paratypes All from type locality:
Nos. 1–38, 21♂♂, 17♀♀ siblings to Holotype, eclosed 24 September to 30 October 1977 (YPM)
Nos. 39–41, 1♂, 2♀ siblings to Holotype but reared on *Prunus serotina,* eclosed 22–30 October 1977 (DFS)
Nos. 42–44, 2♂♂, 1♀ ex Paratype no. 85 reared mostly on artificial diet, eclosed 20–27 October 1977 (YPM)

Nos. 45–51, 3♂♂, 4♀♀ ex Paratype no. 86 reared mostly on artificial diet, eclosed 22–30 October 1977 (YPM)
Nos. 52–62, 3♂♂, 8♀♀ ex Paratype no. 82 reared on *Vaccinium atrococcum*, eclosed ca. 21 October to 28 November 1977 (DFS)
Nos. 63–68, 4♂♂, 2♀♀ ex Paratype no. 84 some reared entirely on *Prunus serotina*, others started on *Quercus* and changed to *Prunus*, eclosed 16–30 October 1977 (DFS)
Nos. 69–72, 2♂♂, 2♀♀ ex Paratype no. 83 reared on *Quercus palustris*, eclosed 26–30 October 1977 (DFS)
Nos. 73–107, 7♂♂, 28♀♀ collected 22–27 February 1977, 3♂♂ and 6♀♀ at various lights, others at sugar bait, *leg.* D.F. Schweitzer (79, 80 DFS; rest YPM)
Nos. 108–110 1♂ 24 March 1977, 2♀♀ 15 December 1971 *leg.* C.V. Covell, Jr. (2 CVC, 1 DFS)
Nos. 111–112, ♂♂ 12 December 1970 and 21 February 1971 *leg.* R.B. Dominick and C.R. Edwards (CVC)
No. 113, ♂ 20 November 1970 *leg.* R.B. Dominick and C.R. Edwards (DFS)
No. 114, ♂ 10 December 1970 *leg.* R.B. Dominick and C.R. Edwards (WC)

Larval Paratypes (fixed in Pampel's fluid, stored in alcohol unless noted, all instars represented):

Nos. 1–77, siblings to Holotype (73–77 freeze-dried)
Nos. 78–149, ex ♀ Paratype no. 82 (128–149 freeze-dried)
Nos. 150–162, ex ♀ Paratype no. 83 (157–162 freeze-dried)
Nos. 163–233, ex ♀ Paratype no. 84 (199–233 freeze-dried)
Nos. 234–306, ex ♀ Paratype no. 85 (306 freeze-dried)
Nos. 307–323, ex ♀ Paratype no. 86 (319–323 freeze-dried)
Nos. 324–330, parent uncertain but one of above (all freeze-dried)
Nos. 331–346, progeny of Paratypes no. 66 and 38

All larval paratypes are in the Peabody Museum of Natural History at Yale except numbers 32–37, 214–231, 325–330, and 331–343 which are currently in the Schweitzer collection (DFS).

Distribution
Besides the specimens listed in the type series others have been examined as follows: FLORIDA: Quincy, Gadsden Co., 21 December to 8 February, 1962 to 1969, 7♂♂, 5♀♀, all *leg.* W.B. Tappan (AMNH, DPI, CPK); Jacksonville, Duval Co., 11 December 1967, ♂, *leg.* C.F. Zeiger, no date, 2♂♂ (DPI); 21 December 1978, *leg.* C.F. Zeiger (YPM); 31 December 1978 to 24 January 1979, 5♂♂, 4♀♀, *leg.* H.D. Baggett (DFS, YPM, HDB); Gainesville, Alachua Co., 8 January 1978, ♀, *leg.* F.W. Mead (CPK); and MISSISSIPPI: Bay St. Louis, Hancock Co., 8, 27 December 1971, 2♂♂, *leg.* R. Kergosien (BM). The Wedge Collection also has a large series from the type locality with dates from at least 20 November to March.

There is some apparently geographical variation among the specimens seen. Those from Quincy, Florida (Figs. 5, 6), tend to be more robust than those from elsewhere, especially the females. Eleven of the twelve are very similar and fairly typical in color, the other approaches the dark form. Those from Mississippi and Jacksonville, Florida, match South Carolina specimens well. Specimens from the type locality vary considerably in size, wing shape, and color.

I expect that this species will ultimately be found in the Atlantic and Gulf Coastal Plains from eastern Texas to eastern North Carolina and perhaps southeastern Virginia

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Metaxaglaea inulta (Grote, 1874)

Orthosia inulta Grote, 1874, Sixth Annual Report Peabody Acad. Sci. 1873: 30

Glaea inulta Grote, 1874, Bull. Buffalo Soc. Nat. Sci. 2: 125; Grote 1875, Check List Noctuidae America, north of Mexico, Part 1: 14

Glaea inulta, Holland, 1903, Moth Book: Pl. 26, Fig. 37

Conistra inulta, Hampson, 1906, Catalogue Lepidoptera Phalaenae British Museum 6: 460

Metaxaglaea inulta, Franclemont, 1937, Canad. Ent. 69: 129

Metaxaglaea inulta, Forbes and Franclemont, 1954, *in* Forbes, Lepid. New York & Neighboring States, part 3, Cornell Univ. Agric. Exper. Sta. Mem. 329:152

The imago of this species (Fig. 8) is very distinctive and should not be confused with any other *Metaxaglaea.* I have seen it confused with *Chaetaglaea sericea* (Morrison) which has similarly even antemedian and postmedian lines. That species is smaller (forewing almost always under 20 mm) and grayish except southward where a brown form does occur. Furthermore, *C. sericea* has conspicuous pale shades along the inner side of the antemedian and outer side of the postmedian lines. Such shades are faint or absent in *M. inulta* which also differs in having a kidney-shaped reniform, which never contains a black point posteriorly. *C. sericea* has a tapered or oval reniform, often with such a spot. Holland (1903) illustrates both species.

The larva and genitalia of both sexes of *M. inulta* are similar to *M. semitaria* and *M. australis.* The egg is unlike that of *M. semitaria* but is quite similar to that of other species of *Metaxaglaea.* Thus, despite its divergent pattern, *M. inulta* exhibits all other normal features of the genus.

The range was adequately described by Forbes (1954) and updated slightly by Schweitzer (1977). It extends from southern Canada southward to Falls Church (DFS) and Arlington, Fairfax Co., Virginia (JGF), and Canton, Lewis Co., Missouri (JRH).

There is some geographic variation in size with specimens from Plymouth, Massachusetts, Novia Scotia, and coastal Maine being smaller than specimens from most other regions. Those from Massachusetts are apparently rather late flying. Such differences could be merely a result of local foodplant usage. I certainly do not believe subspecific names are warranted and I see no evidence at present of sibling species being involved.

There is a rare dark form with a chocolate brown ground color. I have seen it from Armdale, Nova Scotia (YPM), and the barrens at Nottingham, Chester Co., Pennsylvania (DFS).

This species is one of the earliest-flying Lithophanini, being common by late September as far south as Chester Co., Pennsylvania. It rarely persists past October anywhere, except perhaps in Virginia. Eggs generally hatch in late winter (a few in January in Pennsylvania) to early spring, almost always before buds open in Connecticut. Larvae can begin to feed on unopened buds much as in *M. semitaria*.

This species can be locally common but adults wander widely from the larval food and are thus not uncommon almost anywhere in its range. It is, however, rare to absent on the coastal plain from New Jersey southward. Adults come fairly well to black light in southeastern Pennsylvania, as well as to the usual sugar baits.

Early Stages

A partial life history follows here, based on two broods from Plymouth Co., Massachusetts, and one from Litchfield Co., Connecticut. I also have a Kodachrome of a mature larva from the vicinity of Ithaca, New York (J.G. Franclemont), which agrees in all details. Published descriptions include Dyar (1899), Forbes (1954), and Crumb (1956).

I am not certain how may larval instars this species has. I have notes on five, but there are probably six. If so, the following description probably omits the fourth.

Egg
Cream-colored when laid, becoming whitish with dark brown or gray markings concentrated around the micropyle and as a latitudinal band — very similar to all other *Metaxaglaea* except *M. semitaria*. Diameter about 0.9 mm.

Larva
First instar When freshly hatched, gray. Tubercles darker, brown, similar in size to those of *M. semitaria* and *M. australis*. By the end of first instar, medium brown with clear white dorsal, subdorsal, double lateral, and spiracular lines. Cervical shield and anal plate dark brown.

Second instar Dorsum brownish gray, dorsal, subdorsal and lateral lines (now single) white broken only intersegmentally. Spiracular line white, lacking dark upper edging. Venter whitish. Head, cervical shield, and anal plate brown. Subdorsal line clearly defined on cervical shield. Tubercles small, dark, but distinct at 10×.

Third (?) instar Dorsum dark gray, lines as above except subdorsal and lateral much weaker. Dorsal widened to one or two small diamonds on segments two and three. Sometimes also one larger diamond on first seven abdominal segments. Dorsal line fragmented on thorax. Head heavily mottled in whitish and brown with dark ocelli conspicuous at 10×. A strong, curved brown line setting off lateral portions of face. Tubercles dark, inconspicuous. Dorsal area with darker V-markings as in most brownish lithophanine larvae, but faint.

Fourth (?) instar Rather even dark brown, lateral area slightly darker. Venter whitish, mottled with brown. Tubercles inconspicuous but accompanying white patches visible on thorax. Spiracular line white, thinly edged with dark brown. Dorsal line broken, cream-colored, intersegmental dark spots conspicuous. Head less mottled than in previous instar but the brown lines still strong. Anal plate not contrasting. Cervical shield as before. The usual dorsal V-marks faint or absent.

Last (fifth ?) instar Fig. 20. Dirty gray brown, virtually unmarked dorsally though with vague traces of dark diamonds. Mid-dorsal line strong, cream, broken only intersegmentally by dark spots. Lateral area slightly darker than dorsal. Spiracular line white, more diffuse than other *Metaxaglaea* with ventral boundary often poorly defined. Venter mottled whitish gray. Tubercles inconspicuous, dark. Spiracles black projecting well above spiracular line, last one not contacting line. Head brown intricately marked with darker brown (but curved line of previous instars lost). Cervical shield brown, darker than body. Anal plate colored similar to ground of head. To 40 mm or larger.

Foodplants
The foodplants are various species of *Viburnum*, specifically: *V. lentago* L. (Franclemont, personal communication; my own rearings); *V. lantana* L. (Crumb, 1956), *V. nudum* L. (Dyar, 1899). Probably a number of other species of *Viburnum* are also used. Plymouth Co., Massachusetts, specimens seemed to be associated with *V. dentatum* L. *Viburnum acerifolium* L. is toxic to larvae from several localities (Franclemont, personal communication; my own rearings).

Metaxaglaea viatica (Grote, 1874)

Orthosia viatica Grote, 1874, Sixth Annual Report Peabody Acad. Sci. 1873: 29.

Glaea viatica Grote, 1874, Bull. Buffalo Soc. Nat. Sci. 2: 125; Grote, 1875. Check list Noctuidae America, north of Mexico, Part 1: 14.

Conistra viatica, Hampson, 1906, Catalogue Lepidoptera Phalaenae British Museum 6: 461 (in part), pl. 106, Fig. 19.

Metaxaglaea viatica, Franclemont, 1937, Canad. Ent. 69: 129.

Metaxaglaea viatica, Forbes and Franclemont, 1954, *in* Forbes, Lepid. New York & Neighboring States, Part 3, Cornell Univ. Agric. Exper. Sta. Mem. 329: 159 (in part).

Metaxaglaea viatica, Franclemont, 1968, Entomol. News 79: 57–63 (lectotype designated).

This species has recently been redescribed and the genitalia illustrated by Franclemont (1968). It is slightly larger than its congeners except for *M. violacea* n. sp. and with a fairly consistently plain brown color (see key). The male genitalia (Figs. 33, 34) are variable as discussed below, but will readily separate *M. viatica* from all other species except *M. violacea* n. sp. The moth is very similar to *M. violacea* n. sp., but is separable by the wing color and larval characters (see keys). Both species fly at essentially the same time of year with maximum occurrence at bait from mid-November to mid-December in Pennsylvania and southern New Jersey (range for *M. viatica*: 24 September to 23 January). In Mississippi dates are from 10 October to February, apparently peaking in the latter half of December. The specimen from Black River State Forest, Florida, was taken 15 March 1977. A partial life history follows.

Distribution

I have examined specimens from the following localities: MAINE: Kittery Point, York Co. (MCZ); MASSACHUSETTS: Westwood, Middlesex Co. (WDW); CONNECTICUT: Mansfield, Tolland Co.; Beacon Falls, North Haven, Wallingford, New Haven and Hamden, all New Haven Co. (YPM, DFS); NEW JERSEY: Lebanon, Hunterdon Co. (JM, DFS); Lakehurst, Ocean Co. (JWC); New Lisbon (JWC, DFS) and Batsto (DFS), Burlington Co.; Glendale, Camden Co. (DFS); Woodbine, Belleplain and Eldora, Cape May Co. (DFS, YPM); PENNSYLVANIA: Strafford, Chester Co. (DFS); French Creek State Park, Berks Co. (DFS); Auburn, Schuylkill Co. (ELQ); Wayne (DFS) and Swarthmore (JM), Delaware Co.; OHIO: Marietta, Washington Co.; Cincinnati, Hamilton Co., (both MCZ); MISSOURI: Portageville, Pemiscot Co.; Columbia, Boone Co. (JRH); VIRGINIA: Arlington, Fairfax Co. (JGF); KENTUCKY: Butler State Park, Carroll Co.; Valley Station and Okalona, Jefferson Co.; Black Farm, Paducah Co., and Pine Mountain State Park, Bell Co. (CVC); SOUTH CAROLINA: McClellanville, Charleston Co. (WC); Clemson, Oconee Co. (DFS); Greenville, Greenville Co. (DFS); GEORGIA: Forsyth, Monroe Co. (YPM); FLORIDA: Quincy, Gadsden Co.; Shalimar, Okaloosa Co. (CPK, DPI); Black River State Forest (John Nordin); MISSISSIPPI: several localities in Newton, Hinds, Rankin, Hancock, and Warren Cos. — evidently quite common in that state (mostly BM); LOUISIANA; Baton Rouge (DPI); TEXAS: Terrell, Kerr Co. (YPM).

Records of Franclemont (1968) could refer in part to *M. violacea* (below). *M. viatica* is apparently seldom really common in most of its range. It does not appear to be scarcer northward, however, since it is not uncommon in New Haven Co., Connecticut, at Lebanon, New Jersey, or Strafford, Pennsylvania.

There is little or no geographical variation in maculation, and Table 1 suggests there is little or none in genitalia. The presence or absence of the dorsal spine on the male right valve varies even within some broods. There is some size variation, but I have not been able to detect any clear trends. The Texas specimen is unusually small.

Early Stages

Egg

Fig 26. Similar to other *Metaxaglaea (*except *semitaria*), markings either dark brown or gray, diameter ca. 0.6 mm at base.

Larva

First instar Dark brown, or gray, tubercles darker, blackish with faint pale gray or white rings at bases. Setae, black. Head, cervical

shield, anal shield, outer side of prolegs, dark brown. Sometimes a vague pale subspiracular shade, other lines absent. About 2–2.5 mm at hatching.

Second instar Dorsum smooth, dull brown, or neutral gray, lines white, unbroken; dorsal, subdorsal strong; lateral weaker, touching tops of spiracles. Spiracular line white or nearly so, enclosing lower half of spiracles, edged above with darker brown or black shade (unlike *violacea*). Venter pale brown or gray. Head darker brown. Tubercles dark, inconspicuous.

Third instar Ground mottled dark brown; dorsal line strong, lateral obscure. Spiracular line, venter and head as in second instar. Ground color of one larva (Pennsylvania) with strong gray dorsal shades and strong subdorsal line. It was of normal appearance in the fourth instar, however.

Fourth instar Mottled with dark brown on pale brown base, darker laterally. Dorsal line pale, nearly continuous, interrupted at most by dark intersegmental markings. Spiracular line broad, white or often quite pinkish, enclosing lower half of spiracles, edged above with black at least on abdominal segments. Subdorsal and lateral lines absent, except former on cervical shield. Cervical shield darker than body. Dorsal mottling tending to form anteriorly opening diffuse V-marks, or sometimes diamond markings. Venter paler, nearly unmarked brownish, boundary with spiracular line quite sharp. Head shiny brown with minute brown markings. Tubercles visible only with magnification, dark.

Fifth instar Hardly differs from fourth instar, except dorsal abdominal segments always with diffuse, anteriorly opening dark V-marks, arising from the dark intersegmental patches.

Sixth, last, instar Fig. 21, Pale brown, mottled with darker brown flecks, lateral area darkest. Dorsal line prominent, broken only by the intersegmental patches, of ground color or paler, with darker edging. Spiracular line white or pinkish white, broad, well-defined ventrally (not so when in alcohol) and edged dorsally with a strong black or dark brown line, at least on the abdominal segments. Subdorsal and lateral lines absent, except former on cervical shield. Cervical shield darker brown than body. Head shiny brown with minute darker reticulations. Dorsal region with anteriorly opening dark brown V-markings or less often diamonds on most segments, especially well-marked on abdomen. Ventral region paler, nearly unmarked brownish. Tubercles microscopic, thoracic ones sometimes accompanied by visible, but minute, white patches. About 40–50 mm at full growth, depending largely on diet.

This description was based primarily on living offspring of several females from Strafford, Chester Co., Pennsylvania. Living larvae have also been examined from Hunterdon, Camden, and Cape May Cos., New Jersey; Greenville and Oconee Cos., South Carolina; New Haven Co., Connecticut. There is little geographical variation. The Cape May Co. larvae (one brood, Belleplain State Forest) were all much more mottled than most others seen; several were preserved (YPM). Some South Carolina and a few Pennsylvania larvae match them. Hampson's (1906) description of a larva reared by Dyar on "oak, & c." differs from the foregoing in several points. No *Metaxaglaea* larvae appear "sordid greenish" to my eye. The "waxed blackish shade" along the upper edge of a "substigmatal" (= spiracular) line which is otherwise "lost in the subventral color" suggests *M. australis*. The spiracular line is clearly defined ventrally on all *M. viatica* larvae I have seen. The locality for Dyar's larvae is not stated. Large series of preserved larvae are at YPM and in the author's collection.

Foodplants and Notes

Apparently a fairly general feeder on deciduous trees although very few larvae are known to have been found in nature. One was resting on, and later fed on, apple at Banksville,

Westchester Co., New York (J. G. Franclemont, personal communication). I found one feeding at night on *Pyrus xpurpurea* at Hamden, New Haven Co., Connecticut, 12 June 1978. Three more were found resting in bark crevices and debris at the base of the tree the next day and two more were found on the same tree 20 and 21 May 1979. Two were found at the base of a nearby *Sorbus aucuparia* L. (Ehrh.) on 14 June 1978. All were in the last instar and some were reared to maturity on both trees.

I have reared the species from egg to adult on apple and several different crabapples (*Pyrus* spp.) which are the best hosts in the laboratory and when sleeved (although a few cultivars are toxic). Successful rearing has also been accomplished on an ornamental *Prunus* species, several oaks, and red maple (*Acer rubrum* L.). Subsequent attempts using *A. rubrum* failed, however. The larvae grow well on new growth of the "red" oaks but cannot eat the mature leaves of any of the three species tried (*Q. velutina* Lam., *Q. palustris* Muench., *Q. coccinea* Muench.). *Q. alba* L. is a poor host. Larvae sleeved on oaks reach maturity only if started just as the buds begin to open. Larvae can also grow well, initially at least, on blueberry (*Vaccinium* spp.), sweetgum (*Liquidambar*) and *Rosa* sp. *Prunus serotina* Ehrh. is toxic under laboratory conditions. Larvae sleeved on it fail to grow beyond the third instar even after seven weeks of feeding. Sourth Carolina larvae would not accept it at all. Tulip tree (*Liriodendron tulipifera* L.) was accepted by freshly hatched Pennsylvania larvae but they failed to grow on it. Older larvae rejected it. *Sassafras albidum* (Nutt.) Nees was unacceptable to newly hatched Pennsylvania larvae. Hickory, walnut, and ash were rejected by last instar Connecticut larvae. Hickory (*Carya* sp.) buds did not support normal growth of newly hatched Connecticut larvae.

At least northward, *M. viatica* is most common in suburban residential areas and probably feeds primarily on rosaceous ornamentals such as crabapples and apple *(Pyrus)* and *Sorbus*, in such habitats.

There is great variation in egg-hatching time between and within various clutches when stored together (Schweitzer, 1977). When kept outdoors in Connecticut they hatched mostly from late March to late April.

Genitalic variation The male genitalia of this species and the following new species are remarkably variable. About 80% of *M. viatica* specimens examined lack the dorsal apical spine on the cucullus and are thus in agreement with the figure and description given by Franclemont (1968). However, spined specimens (Figs. 33, 34) also occur in most or all populations (Table 1). These are readily separable from *M. semitaria* and *australis* by the relatively long, slender terminal spine on both valves, which is much shorter on *M. semitaria* and *australis*. Reliable separation of *M. viatica* and the new species below is apparently not possible solely on the basis of genitalia.

The new species described below appears to have been universally confused with *Metaxaglaea viatica* (Grote), with which the imago is nearly identical except in color. However, the species differ strikingly in larval characters and ecology. They are sympatric throughout most of their ranges.

Metaxaglaea violacea, new species

Metaxaglaea viatica, Forbes and Franclemont, 1954, *in* Forbes, Lepid. New York & Neighboring States, Part 3, Cornell Univ. Agric. Exper. Sta. Mem. 329: 152 (in part).

Head and thorax reddish brown, often contrastingly lighter or darker than forewings. Forewings reddish brown to maroon with more or less violet iridescence, frosted with white scales especially within and below antemedian and within postmedian lines. Basal line double, inner element strongest, seldom complete. Antemedian line waved, double, somewhat convex, fading out before inner

margin, variable in exact course, but always closest to base at costa. Median shade dark, vaguely defined basally, tangent to or passing through basal half of reniform, often completely traceable but commonly fading out towards costa. Postmedian line double, dark brown to blackish, inner element strongest, filled as in antemedian line, slightly convex in course and sharply dentate on veins, terminating outwardly on veins with a black point, this usually followed by a pale point. Subterminal line, contrastingly pale, inwardly edged with deep reddish brown, general course parallel to outer margin but sharply offset inward from costa to vein R_5. Fringes paler, especially at their base, gray sometimes with a bluish tint. Veins Cu and Cu_2 are sometimes partially outlined in white. Orbicular, outlined in deep reddish brown with an inner pale ring; filling, of ground color; size and shape extremely variable, sometimes touching reniform. Reniform doubly outlined like orbicular, kidney-shaped, filled with ground color but often largely occupied by the intrusion of median line. Claviform, absent, but one female (Paratype no. 88, Fig. 14) with extra double ring from orbicular across antemedian line. Basic ground color palest between antemedian and postmedian lines. Hindwing fuscous dorsally with paler fringes, unmarked or with faint darker postmedian line and/or discal spot, ground color sometimes somewhat pinkish.

Underside of both wings pale grayish dusted with red, especially near costae and outer margins. Red scaling absent on forewing disk which is blackish. Postmedian line and discal spot darker blackish on both wings.

Legs with femora clothed with long, reddish hairlike scales. Tibiae red ventrally, white dorsally. Tarsi, white. Antennae with scape and outer surface of basal third white, otherwise reddish brown.

Dorsum of abdomen fuscous with pale brown hairlike scales along sides and at posterior end in both sexes. Entire dorsum of abdomen, sprinkled with scales of like color which occasionally dominate over the fuscous. Venter of abdomen similar to dorsum but somewhat reddish.

Forewing length 21.0–24.5 mm (mean ♂ Paratypes no. 173–182, 22.5; ♀♀ Paratypes no. 221–230, 23.0).

Male genitalia as figured (Figs. 35–37); with a dorsal apical spine on the outside of the cucullus (see Franclemont, 1968) of the right valve and sometimes (Fig. 36) with such a spine on the left valve as well. When present, the spine on the left valve is quite variable in size.

Female genitalia as figured (Fig. 38); not obviously different from other *Metaxaglaea* species.

Diagnosis, imago

The only known apparently reliable distinction of adults from *M. viatica* is in the violet and reddish coloration of the primaries and body which contrasts sharply with the leather brown of *M. viatica*. When worn, *M. violacea* is darker than *M. viatica* in similar condition. The forewing coloration of *M. violacea* is difficult to characterize, since it is essentially composed of a violet iridescence on a red-brown base. Most specimens approahc Maroon or occasionally Bordeaux of Ridgway (1913), approximately S–5–8° (Scarlet) of Villalobos and Villalobos (1947). Some vary towards Villalobos' "RS" series: the palest fresh specimens are close to their S–10–9°.

It appears that males with both valves lacking the spine on the cucullus can be safely assigned to *M. viatica;* but other specimens cannot be separated on this character, since *M. viatica* may also have such spines on the right valve only or very rarely on both valves, as discussed under that species. These spines are generally smaller on *M. viatica* than on *M. violacea,* and the valves tend to be narrower on *M. violacea*. However, some *M. viatica (e.g.,* Fig. 33) are hardly distinguishable from normal *M. violacea* on the basis of

genitalia. The larva of *violacea* is strikingly different from all other *Metaxaglaea*.

Early Stages

Egg

Fig. 27. Hemispherical. Yellowish when laid, after a few days becoming whitish with brown or gray dusting concentrated at the micropyle and as a median band. Diameter, at base about 0.6 to 0.7 mm.

Larva

The following larval descriptions were made from about 1,100 living individuals, and color photographs of larvae from nine broods from New Jersey and one brood from South Carolina, reared from 1972 to 1977.

First instar Fig. 28 a,b. When hatched, unmarked dark brownish gray, sometimes with a violet or pinkish cast but usually with neither. Tubercles similar in size to those of *M. viatica,* black, faintly ringed with white. Head, cervical shield, prolegs, dark brown. About 2.0–2.5 mm when hatched.

Second instar Body smooth, more or less bluish gray. Tubercles large, black, conspicuous. Dorsal, subdorsal, and lateral lines white (lateral probably sometimes absent). Spiracular line whitish, faintly darker around spiracles, which are black. Venter and head paler.

Third instar Body colored as before. Tubercles large, black, very conspicuous. Dorsal line cream-colored, broken, surrounded by a large yellow patch on each segment except first and last. Subdorsal line fine, broken, pale. Spiracular line bright yellow (rarely cream, variable within most broods), enclosing spiracles. Lateral line not discernable at low magnification. Spiracles black. Venter and head paler gray. Sometimes conspicuous black spots on head.

Fourth instar Body bluish gray to nearly sky blue marked exactly as in third instar except spiracular line always at least partially of the yellow color. Head more brownish. General effect brighter than third instar. Size, to about 27 mm at rest.

Fifth, last, instar Figs. 22, 23. Initially very similar to fourth instar. All colors become much less intense and with a general brownish shade as maturity approaches. Venter becomes brown with white mottling. Head mottled brown. Yellow dorsal patches become tan and dorsal ground color, dull gray-brown. Tubercles remain black. Size to slightly over 50 mm.

Foodplants and Notes

At present American holly (*Ilex opaca* Ait.) is the only known host in the field. Larvae have been collected on it in Delaware (Frank Morton Jones, reared 1936, YPM) and Florida (see below). In the laboratory, first instar larvae sometimes accepted *Amelanchier* spp. but soon died. They rejected many other woody plants. First and last instar larvae accept *Prunus serotina* Ehrh. shoots which cause paralysis, and usually death, within an hour. Larvae will eat oak aments which were originally thought to be the food (Schweitzer, 1974), but they almost never eat young oak leaves. However, growth on oak is poor in the laboratory, worse in sleeves and the larvae rarely reached the third molt even after 3 to 6 weeks of feeding. Only 7 of well over 700 reached the last instar (various years) on oaks. On holly, growth was rapid and full growth attained in about a month, sometimes less in the laboratory. However, with laboratory lots, nearly all died at maturity, probably due to poor quality cut food, much of which was mailed from out of the state, since fresh holly was relatively unavailable to me in proper condition. (Several other "Glaeas" are similarly difficult to rear on fresh cuttings but do well when sleeved.)

Larvae of *M. violacea* eat any part of the new growth of *Ilex opaca,* being especially partial to soft, young twigs in their last instar. Female flowers are least often eaten. Newly hatched

larvae will eat the waxy coating on unopened buds, but mature leaves are never eaten. Larvae will feed and grow well, at least for several days, on *Ilex glabra* (L.) Gray and this may be an alternate host in New Jersey. Other evergreen *Ilex* species might be used; however, a deciduous species was rejected.

Ninety-five of 103 first instar larvae sleeved on *I. opaca* reached aestivation in 1976. Of these, however, only 67 eclosed. A search revealed 18 dead pupae with nearly or completely formed moths inside. I suspect these died from inadequate moisture, although I have never had similar problems with related species kept under essentially the same conditions. Larvae of *M. violacea* spin their initial aestivation cocoons much deeper than most Lithophanini (usually more than 2 inches deep). They often abandon these, and go even deeper into the soil. *M. viatica* larvae also sometimes abandon their first cocoon before pupation. Both species occasionally ultimately pupate without a cocoon.

Last instar larvae of this and other *Metaxaglaea* leave the food and hide by day. Probably they usually enter the soil. Earlier instars of this species, unlike other *Metaxaglaea*, rest exposed on the foliage. The significance of their bizarre coloration is unknown.

Although examination of preserved laboratory reared material might suggest 6 instars, this appears to be due to individual variation in size, i.e., almost certainly to nutritional dwarfing. Numerous isolated larvae were monitored closely in sleeves and in the laboratory and all had 5 instars. Sleeved larvae reached much larger sizes.

Seasons Adults, 9 October to 21 April in New Jersey, but few after mid-January (mostly in 1977, after a very cold fall and winter); 20 November to 18 March in South Carolina, there often surviving the winter as adults (3 out of 11 in the Wedge Collection taken in March). This species was common near McClellanville, South Carolina, in late February, 1977, females being quite gravid and mated.

Generally, eggs overwinter and hatch about as holly buds open in the spring. Larvae apparently complete feeding at the end of May in Delaware (Jones, notes with specimen). They then aestivate in the soil, pupating in late summer. Larvae took about six weeks to mature in sleeves, about four weeks in the laboratory. The aestivation and pupal periods lasted a total of about 90 to 130 days for New Jersey stocks and about 120 to 150 days for South Carolina stocks under outdoor conditions in southern Connecticut.

Type Material

The present or intended deposition of specimens is noted in parentheses. Abbreviations are explained under Collections Consulted.

HOLOTYPE Fig. 12. Male, labelled "N.J.: Camden Co., Evesham Twp. *ex ovo* from Para. no. 55 eclosed 21 Sept. 1976, larva sleeved on *Ilex opaca* at New Haven, Ct. ca. 19 April to 28 May–5 June, 1976 *leg*. Dale F. Schweitzer" (YPM).

ALLOTYPE Fig. 13. Female, sibling to Holotype, same data but eclosed 6 October (YPM).

Paratypes Since larval characters are so crucial in establishing the validity of this species, all preserved larvae are designated Paratypes, but listed and numbered separately from the adults. Adult Paratypes are as follows:

Nos. 1–54, 21 ♂ ♂, 33 ♀ ♀ siblings of Holotype eclosed 17 September to 14 October 1976 (1–44, YPM; 45–54, DFS)
Nos. 55–63, 7 ♀ ♀ from type locality 30 November 1975, *leg*. D.F. & T.M. Schweitzer & Carol Waters and 2 ♀ ♀ 6 December 1975, *leg*. Carol Waters (55 mother of Holotype, YPM; 56–63, DFS)
Nos. 64–72, 4 ♂ ♂, 5 ♀ ♀ Lakehurst, Ocean Co., NEW JERSEY, various dates from 13 October to 10 December 1937–40 and 1946, *leg*. J.W. Cadbury III and in his collection

Nos. 73, 74 same locality, ♂ 17–24 October and ♀ 21–30 November, Frederick Lemmer (AMNH)
Nos. 75–95, 9♂♂, 12♀♀ Batsto, Burlington Co., NEW JERSEY, various dates from 29 October to 24 December, 1969 to 1976, *leg.* D.F. Schweitzer or Annie Carter or both (DFS)
Nos. 96–98, 2♂♂, 1♀ reared *ex ovis* from Paratype 91 and either male 75 or 76, eclosed 17 September to 6 October 1975 (DFS)
Nos. 99–104, New Lisbon, Burlington Co., NEW JERSEY, *leg.*, J.W. Cadbury III and D.F. Schweitzer 2♂♂, 9 October 1970 and 13 October 1971; 4♀♀, 25–30 November 1972; 2♀♀ from bait traps 1 December 1972 to 22 January 1973; ♀ 2 February 1973 (99, 100, 104 DFS; 101, 102 JWC; 103 A.E. Brower)
Nos. 105, 106, ♂♀ Woodbine, Cape May Co., NEW JERSEY, 30 October 1976, *leg.* Joseph Muller & D.F. Schweitzer (YPM)
Nos. 107–161, 26♂♂, 29♀♀ Eldora, Cape May Co., NEW JERSEY, various dates from 15 October to 11 January, 1973–1976, *leg.* Joseph Muller, C.B. Worth or both (107–144, JM; 145, 146 CBW; 147–156, 159–161 YPM; 157–158 DFS)
Nos. 162–172, 6♂♂, 5♀♀ same locality, *leg.* Joseph Muller & D.F. Schweitzer, 13 October 1976 (DFS)
Nos. 173–238, 35♂♂, 31♀♀ same locality, *leg.* Joseph Muller & D.F. Schweitzer, 30 October 1976 (173–231, DFS; 232–238 YPM)
Nos. 239–351, 50♂♂, 63♀♀ same locality, *leg.* C.B. Worth, 2 November 1976 to 17 April 1977, (267–313, 319–333, 346, 351 YPM; rest DFS)
Nos. 352–357, Belleplain State Forest, Cape May Co., NEW JERSEY, 2♂♂, 4♀♀ 7, 9, 10 November 1975, *leg.* D.F. Schweitzer & Robert Waters (YPM)
Nos. 358–362, 2♂♂, 3♀♀ *ex ovis* from Paratype no. 357, eclosed 29 September to 8 October 1976 (YPM)
Nos. 363–390, Evesham Twp., NEW JERSEY, 17♂♂, 11♀♀, *ex ovis* from mating of Paratypes no. 10 and 27. Eclosed 18 September to 17 October 1977 (DFS)
No. 391, 1♂, Rehoboth (Lewis on handwritten label), Sussex Co., DELAWARE, reared 14 September 1936 by F.M. Jones (YPM) from a larva found on and fed on holly; other plants were rejected. Specimen accompanied by a pupal shell and a good larval description. The moth bears a label "2294 *Epiglaea apiatà* Grt. comp. E. Darl. coll.," presumably refering to a comparison in the collection of the late Emlen P. Darlington.

Larval Paratypes All instars are represented. Unless noted, larvae are in alcohol; 1975–1976 larvae were fixed in Pampel's fluid. Some larvae were freeze-dried to conserve color. All are from NEW JERSEY. All 1975, 1976, and 1977 larval paratypes were reared on *Ilex opaca*. Prior to 1975, oak aments were used.

Nos. 1–57, Batsto, 1975, from Paratype no. 91 (34–57 freeze-dried; 1–40, YPM; 41–56, DFS; 57 JM)
Nos. 58–79, Batsto, 1975, from Paratype no. 92 (DFS)
Nos. 80–102, Batsto, 1975 from Paratype no. 93 (YPM)
Nos. 103–114, Batsto, 1975, from Paratype no. 94 (YPM)
Nos. 115–118, Batsto, 1975, mixture from Paratypes no. 91, 90 (DFS)
Nos. 119–151, New Lisbon, 1973, From ♀ nsp. 72.1 (moth too poor to be a paratype) (YPM)
Nos. 152–170, Batsto, 1974, from Paratype no. 86 (190 freeze-dried; all DFS)
Nos. 171–190, Batsto, 1974, mixture from Paratype no. 86 and ♀ nsp. 73.3 (moth too poor to be a paratype), (187–190 freeze-dried, all DFS)
No. 191, Belleplain, 1976, from Paratype no. 357 (YPM)
Nos. 192–193, Evesham Twp., 1976, siblings of Holotype (YPM)
No. 194, Evesham Twp., 1975, from Paratype no. 56 (DFS)
Nos. 195–197, Evesham Twp., 1977, from mating of Paratypes no. 10 and 27 (197 freeze-dried) (YPM)

Since eggs and pupae seem to be of little or

no value in recognizing this species, I decline to designate any as paratypes. However, there are many pupal shells and 17 dry or alcoholic pupae at YPM and one pupa in the author's collection. Likewise a few eggs will be conserved in both collections. All pupae are from the brood including the Holotype, except the pupal shell with Paratype 391.

This moth is usually taken in somewhat worn condition, most commonly late in its season. Therefore, I have purposely included representative moderately worn adults as paratypes in the hope they will facilitate determination of this species by others. In particular, many paratypes in the author's collection are somewhat worn. Other than those from Belleplain and those listed as parents of broods, all Peabody specimens are in good to fresh condition. Three paratypes were at UV light, the others, at sugar baits or reared.

Distribution

I have limited the type series to specimens from a small area in case sibling species or subspecies are eventually discovered. However, the following additional specimens have been carefully examined and in my opinion are *Metaxaglaea violacea:* VIRGINIA: Arlington, Fairfax Co., at least 11♂♂ (JGF); SOUTH CAROLINA: Florence, Florence Co., 1♂; and Clemson, Oconee Co., 1♀ (DFS); McClellanville, Charleston Co., 2♂♂, 6♀♀ (WC), 3♂♂, 10♀♀, 23–26 February 1977 (YPM) and 1♂ 15 December 1971 (CVC); FLORIDA: Quincy, Gadsden Co., 1♂ 8 January 1968 (CPK); Torreya State Park, Liberty Co., 3 larvae on *Ilex opaca* 22–23 April 1979, 2 collected, *leg.* D.F. Schweitzer; one was preserved (YPM), other is currently in aestivation (moth will go to YPM): MISSISSIPPI: Pearl, Rankin Co.; 3 January 1972, 1♀ (BM); KENTUCKY: Pine Mountain State Park, Bell Co., 23 October 1970, 1♂ (CVC). The genitalia of the last have the spine on the cucullus of the right valve aberrant, being rather wedge-shaped and nearly horizontal. There is a bulge on the left valve. I also reared a series (in YPM) from McClellanville, South Carolina. Larvae and adults match New Jersey specimens very closely.

Key to the Species of Metaxaglaea, Imagines

1 Primaries with postmedian line nearly even, not dentate on veins, antemedian similar . . . . . *inulta*

Postmedian line dentate on veins, antemedian irregularly waved 2

2 Thorax and primaries deep reddish brown with violet iridescence . . . . . *violacea*

Color not dark reddish, less or no iridescence, may be slightly orange 3

3 Small, ♀♀ with primary 18–21 mm, ♂♂ rarely over 20 mm in wild-caught specimens, color variable (Deep South only) . . . . . *australis*

Both sexes larger, primary seldom less than 22 mm, often over 25 mm 4

4 Color of primaries approximately Tawny of Ridgway (1912) or more yellow or orange, male genitalia of *australis* type (Figs. 29, 30), i.e., with short terminal spine . . . . . *semitaria*

Color variable, but usually Kaiser Brown to Chestnut Brown of Ridgway, rarely somewhat yellowish, male genitalia with terminal spine on valves long and thin (Figs. 33, 34); usually lacking dorsal apical spine on cucullus of both valves . . . . . *viatica*

Notes Specimens of *inulta* and *violacea* should present no problems, but a few specimens of the other species are extremely difficult to determine. Dwarf *viatica* occasionally occur and about 0.5% of New Jersey *semitaria* are very dark and would run to *viatica*, but these usually have the pattern blurred and the thorax the normal tawny. A very few fresh *viatica* are pale enough to run to *semitaria* on color. Worn females are best determined from their eggs. Oversized *australis* might occur.

Last Instar Larvae

1 Tubercles black, conspicuous to the naked eye; body color blue-gray with yellow dorsal patches; fading to pale brownish gray at maturity . . . . . *violacea*

Tubercles minute, virtually invisible without magnification, or with accompanying pale patches visible on thorax; body often brownish, never bluish 2

2 Spiracular line clearly edged dorsally with a nearly or quite continuous chocolate brown or black shade which is darker than dorsal ground color 3

Spiracular line not so edged; but may have dark patches or diagonal streaks associated with spiracles and/or an apparent dark edging which is actually composed of dorsal ground color without pale reticulations 4

3 Tops of spiracles projecting above dark dorsal edging of spiracular line on abdominal segments 1–6 5

Bottoms of spiracles projecting below bottom of dark dorsal edging of spiracular band on abdominal segments 3–7 . . . . . *viatica*

4 Cervical shield and anal plate contrasting, dark brown, otherwise dorsum almost unmarked at maturity . . . . . *inulta*

Cervical shield often contrasting, but anal plate merely browner than rest of dorsum, hardly darker; more dorsal mottling . . . . . *semitaria*

5 Abdominal segments 1–5 with dark dorsal edging of spiracular line reaching a distinct apex at intersegmental junctures, descending linearly both anteriorly and posteriorly to a point just behind spiracles . . . . . *australis*

This edging, when present, not entirely linear, often forming a plateau between spiracles and descending abruptly to point just behind spiracles; if no plateau at least some rounding or flattening near intersegmental junctures . . . . . *semitaria*

Discussion

Taxonomy

A few summary remarks are appropriate regarding the species of this genus. As of now, there are five named species in this genus, and McDunnough (1938) placed *Cerastis adulta* Guenée (1852) here as well. The true identity of this moth is unknown. The larval description given by Guenée does not match any known species. Both adult and larval descriptions were based on an unpublished painting by John Abbot. Two or perhaps three different adults have been figured on different sets of Abbot plates (Franclemont, personal communication, 1979). According to Dr. Franclemont one moth appears to be an *Abagrotis:* the other may be one of the "glaeas," or a *Rhynchagrotis.* I have seen the plate at the Houghton Library of Harvard University, which shows a moth of about the color, shape, and size of a very pale *M. australis* but with details such as the postmedian line indicating some other genus. I tentatively consider the illustrated moth to be *Chaetaglaea tremula* (Harvey). If accurate, the figure could not be any known *Metaxaglaea.* I cannot place the larva shown on this plate. It is vaguely like that of *M. violacea* but has white tubercles and shows several other differences. It is not *C. tremula.*

The similarity of the species in egg, first instar larval, genitalic, and imaginal maculation characters strongly suggests this genus is a natural group. Nevertheless, slight differences in the size and shape of the spines on the male genitalia do suggest two species groups: 1) *semitaria, australis, inulta* and 2) *viatica, violacea.* The unique tubercle and color characters of late instar *M. violacea* larvae might suggest the erection of a new genus. However, I have not found other important differences, and this species is extremely close in genitalia to *M. viatica.*

Franclemont (1937) and Forbes and Franclemont (*in* Forbes, 1954) reported several points of difference in the male genitalia between *Metaxaglaea* and related genera such as *Epiglaea* Grote, *Chaetaglaea* Franclemont and *Sericaglaea* Franclemont. Crumb (1956) considered genera of this group to be weakly defined on the basis of larval characters, although he had only one species of *Metaxaglaea (inulta).* With the exception of *M. violacea,* other *Metaxaglaea* larva are close to *M. inulta,* except that Crumb's key character (p. 175) of "Spiracles entirely within the pale subventral coloration on median abdominal segments . . ." does not hold. I have reared *Chaetaglaea tremula* and its larva is extremely close to *C. sericea* (Morrison). I have also found that northern populations of *Epiglaea* and *Chaetaglaea* species have an egg diapause, unlike species of *Metaxaglaea* and *Sericaglaea* (Schweitzer, 1977).

On the basis of the above evidence, I consider *Metaxaglaea* to be a distinct genus and concur with its placement by Forbes and Franclemont (*in* Forbes, 1954). However, it is possible that if a more thorough morphological study of this group were undertaken, generic lumping would be indicated.

I suggest arranging collection specimens of *Metaxaglaea* in the following sequence:

1 *australis*
2 *semitaria*
3 *inulta*
4 *viatica*
5 *violacea*

Genitalic Variation

Intraspecific variation in certain genitalic characters is probably widespread among Lepidoptera and has been noted by several authors (e.g. Adams and Bertoni, 1968; Gall, 1976). However, I am not aware of other examples of the sort of discrete polymorphism found in *M. violacea* and *viatica* in which a conspicuous spine may be either present or

Table 1. Frequency of male genitalia morphs of M. viatica and M. violacea in field-collected samples. Percentages are given in parentheses.

Population	both valves unspined	only right spined	both valves spined
M. viatica			
Connecticut	23 (82.1)	5 (17.9)	0
S.E. Pennsylvania	11 (78.6)	2 (14.3)	1 (7.1)
S. New Jersey	12 (87.0)	2 (13.0)	0
Mississippi	15 (83.3)	2 (11.1)	1 (5.6)*
TOTAL	62 (82.7)	11 (14.7)	2 (2.7)
M. violacea			
S. New Jersey	0	39 (76.5)	12 (23.5)
Arlington, Virginia	0	10 (90.9)	1 (9.1)
E. South Carolina	0	5 (83.3)	1 (16.7)
TOTAL	0	54 (79.4)	14 (20.6)

* The designation for this specimen is a bit arbitrary. The spine on the left valve is small but definite, that on the right valve is more an obtuse triangle or wedge than a spine, but I do not wish to erect a separate category for this specimen (slide DFS 7901, YPM).

absent on one or both valves. There is in addition a somewhat intermediate condition in which a more or less distinct bulge occupies the position of the spine on the left valve. Figure 33 shows an extreme example. Two Connecticut specimens have similar structures on their right valves only. In Table 1, bulges are not considered to be spines.

The significance of this polymorphism is unclear, but it is certainly not a result of interspecific hybridization. Hybridization would not be expected to be of frequent occurrence in this instance anyway, since the known range of *M. violacea* is entirely within that of *M. viatica* and there is no reason to believe their sympatry is recent.

The spines are quite fragile and many, probably most, field-collected males of *M. viatica* at least have the tips of one or both terminal spines broken off. Probably this damage is incurred during copulation.

Ecology

The specializations of these moths with regard to their larval feeding ecology are noteworthy. *M. semitaria* and *inulta* are nearly, or quite, unique in their specializations for beginning to feed during the winter months on deciduous hosts. Eggs of both often hatch well before the new growth appears in spring, even when they are kept outdoors in complete shade from the time of oviposition, and the larvae feed for some time on unopened buds.

M. viatica eggs have an unusually variable hatch time within, as well as between, clutches deposited at the same time and stored together. Its larvae are probably fairly general feeders and can start to feed on opening buds and flowers of several woody genera. The variable hatch time probably is an adaptation to the varying seasonalities of potential hosts. Larvae do very poorly if feeding is not initiated within a very few days of bud-burst. *M. violacea* eggs hatch rather late, as an adaptation to the late leafing of the host. The larvae can begin feeding on slightly swollen buds.

In all five species the larval hatching time is determined in part by the oviposition time of the adults. There appears to be no egg diapause, and the earlier eggs of a given female will hatch before her last eggs (Schweitzer, 1977). When freshly laid eggs are placed in controlled environment chambers, they hatch in about two to four weeks (depending on species) under either long-day (16-hour) or short-day (10-hour) photoperiod at 20–21° C photophase, 14° C dark period. This also indicates lack of diapause as does the fact that *M. inulta* and *M. semitaria*, at least, sometimes hatch outdoors in January. There is thus no obligate suspension of development during winter. It is interesting to note that these two species reproduce earlier than the others in most areas, thereby increasing the tendency for their eggs to hatch at an early date.

Acknowledgements

I wish to thank all the persons and staffs of the institutions listed whose collections were consulted or borrowed from for this study.

Drs. Theodore D. Sargent and Auburn E. Brower read early versions of the manuscript and offered many helpful suggestions. Dr. Charles L. Remington read later versions and offered much helpful advice. Dr. John G. Franclemont was very helpful in many ways, including early instruction in preparation of genitalia mounts. Annie Carter, John W. Cadbury III, Carol Waters, Robert Waters, and Richard Peigler all generously aided in collecting and obtaining livestock. I wish to thank Dr. C. Brooke Worth for permission to collect on his land at Eldora, New Jersey, and for collecting many specimens in my absence.

Drawings are by Deborah Townsend. Gross outlines were traced using a Bausch and Lomb Tri-Simplex Micro-Projector. Photographs were taken at the Peabody Museum Photography Laboratory by William Sacco, David Holbrook, and Mary Duncan.

I gratefully acknowledge a travel grant from the Sigma Xi Foundation and the gracious hospitality of Tania Dominick during my 1977 field work in South Carolina. Without both, *M. australis* would not have been recognized as new.

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Figures

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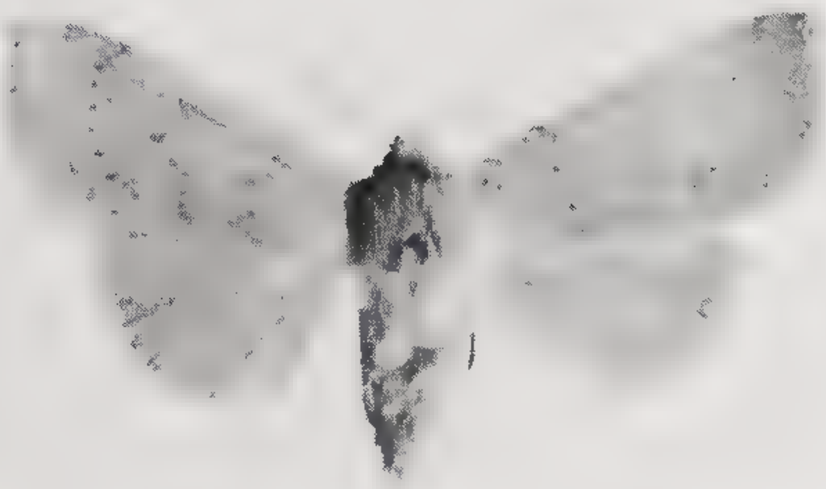

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Figs. 1–8
Imagines of the *Metaxaglaea australis* group (1 ×)

1 *M. australis* ♂, Holotype (YPM)
2 *M. australis* ♀, Allotype (YPM)
3 *M. australis* ♂, Paratype no. 10, (Note aberrant forked right antenna; see Fig. 30). (YPM)
4 *M. australis* ♀, Paratype no. 96 (YPM)
5 *M. australis* ♀, fairly typical Florida specimen; Quincy, Gadsden Co., 7 January 1963, *leg.* W.B. Tappan (AMNH)
6 *M. australis* ♀, exceptionally broad wings; Quincy, Gadsden Co., Florida, 8 February 1969, *leg.* W.B. Tappan (CPK)
7 *M. semitaria* ♀, normally marked and fresh coloration, Mystic, New London Co., Connecticut, 14 October 1928, *leg.* H.P. Wilhelm, (YPM)
8 *M. inulta* ♂, Mystic, New London Co., Connecticut, 26 September 1924, *leg.* H.P. Wilhelm (YPM)

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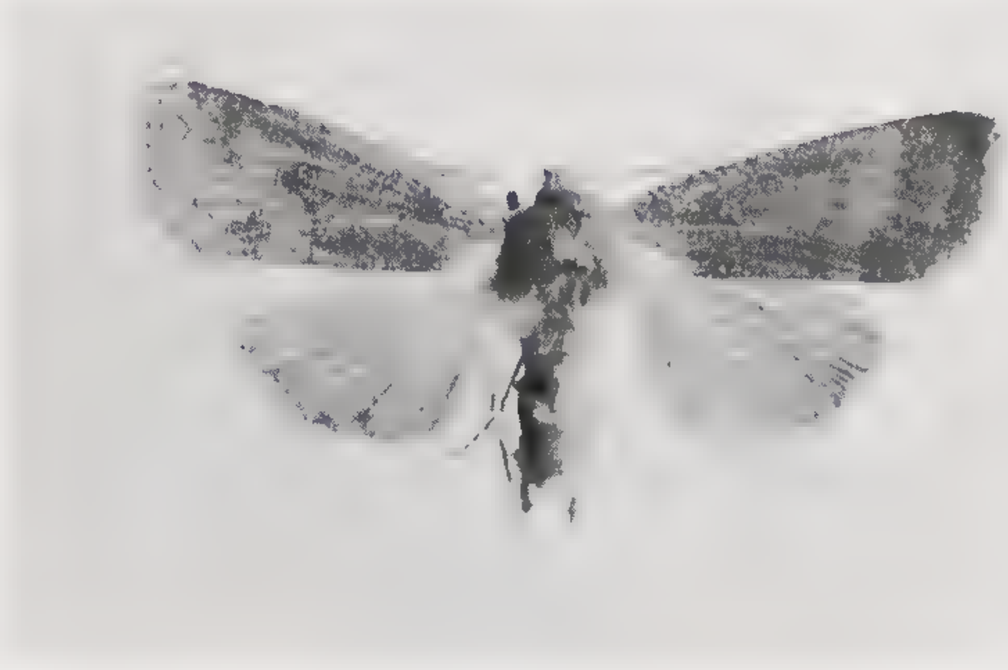

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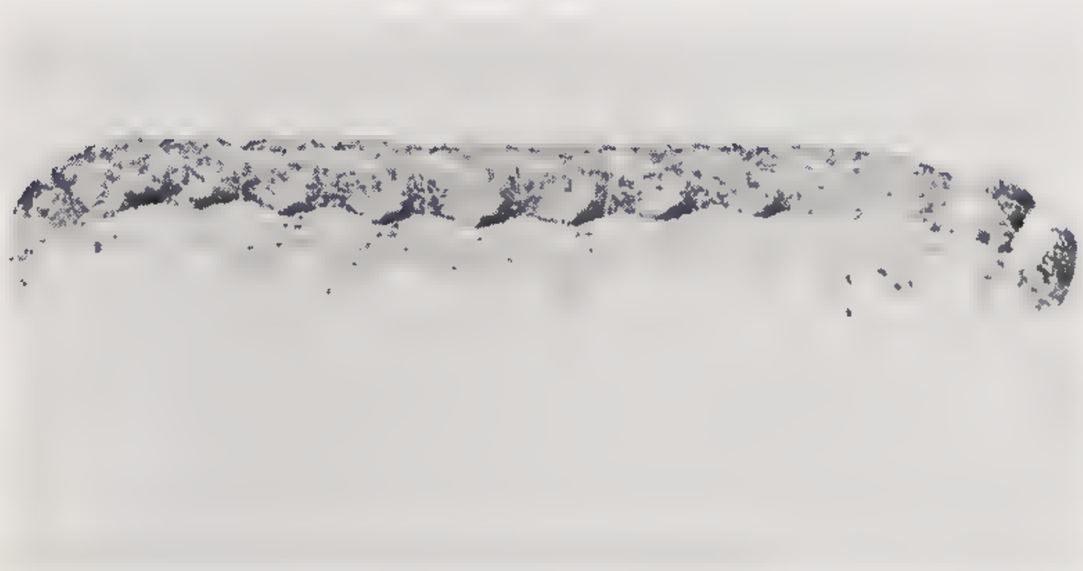
Figs. 9–15

Imagines of the *Metaxaglaea viatica* group (1 ×)

9 *M. viatica* ♂, *ex ovo,* Strafford, Chester Co., Pennsylvania (1974–1975 stock StI), ecl. 20–22 September 1975, *leg.* D.F. Schweitzer (YPM)
10 *M. viatica* ♂, very narrow wings, Eldora, Cape May Co., New Jersey, 30 October 1976, *leg.* D.F. Schweitzer & J. Muller (DFS)
11 *M. viatica* ♀, broad wings (also worn), Strafford, Chester Co., Pennsylvania, 23 January 1974, *leg.* D.F. Schweitzer (DFS)
12 *M. violacea* ♂, Holotype (YPM)
13 *M. violacea* ♂, Allotype (YPM)
14 *M. violacea* ♀, Paratype no. 88. Note aberrant suborbicular markings. (DFS)
15 *M. violacea* ♀, Clemson, Oconee Co., South Carolina, 26 November 1973, *leg.* R.S. Peigler (DFS)



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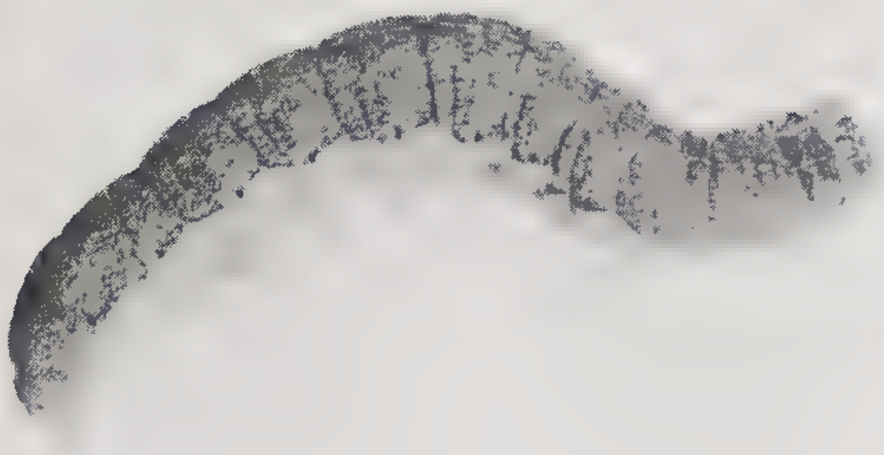

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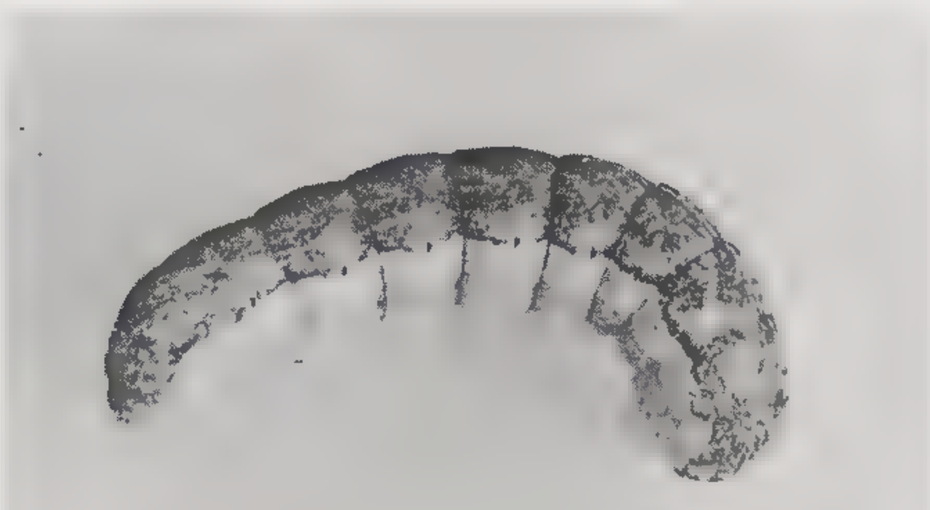

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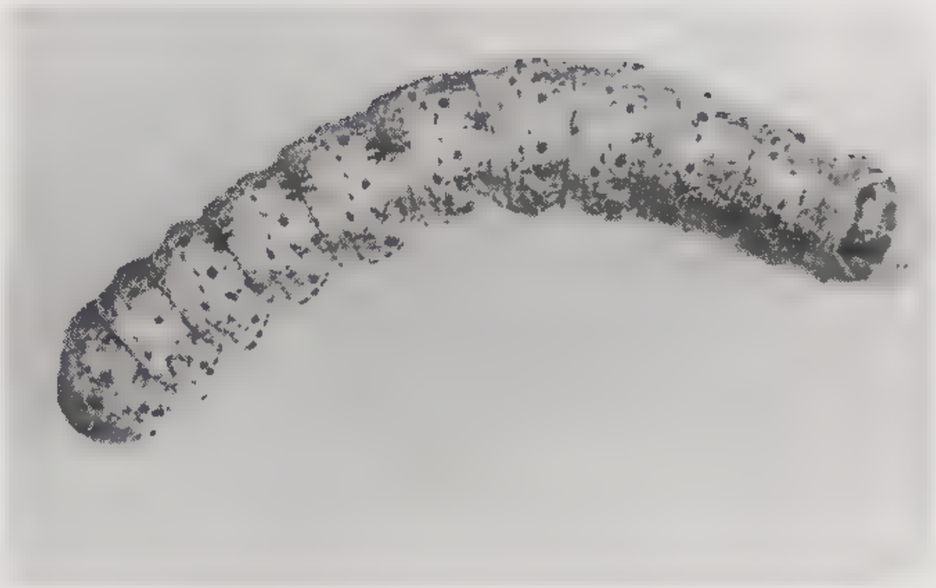

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Figs. 16–23
Last instar larvae of *Metaxaglaea*. Larvae are 1.7× life size; all were photographed alive except Fig. 16 which was freeze-dried.

16 *M. australis*, larval Paratype no. 324
17 *M. australis*, larval Paratype no. 344, lateral
18 *M. australis*, larval Paratype no. 345, dorsal
19 *M. semitaria, ex ovo* on *Vaccinium atrococcum*, Batsto, Burlington Co., New Jersey, *leg.* D.F. Schweitzer, April–May 1978 (YPM)
20 *M. inulta, ex ovo* on *Viburnum lentago*, vic. Plymouth, Plymouth Co., Massachusetts, *leg.* and bred D.F. Schweitzer, April–May 1978 (YPM)
21 *M. viatica, ex ovo*, fed mostly *Quercus palustris*, Strafford, Chester Co., Pennsylvania, *leg.* and bred D.F. Schweitzer, 1975
22 *M. violacea*, one of larval Paratypes no. 1 to 57, dorsal (YPM)
23 *M. violacea*, same larva as Fig. 22, lateral

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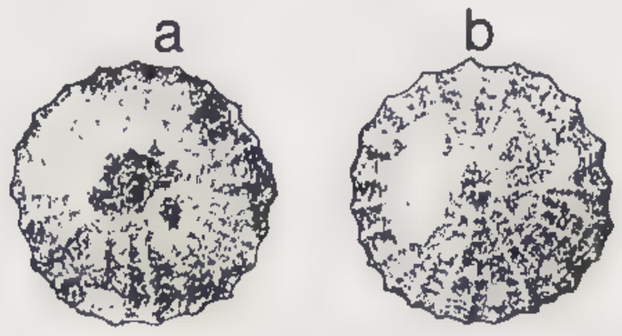

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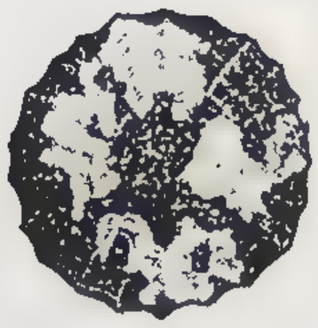

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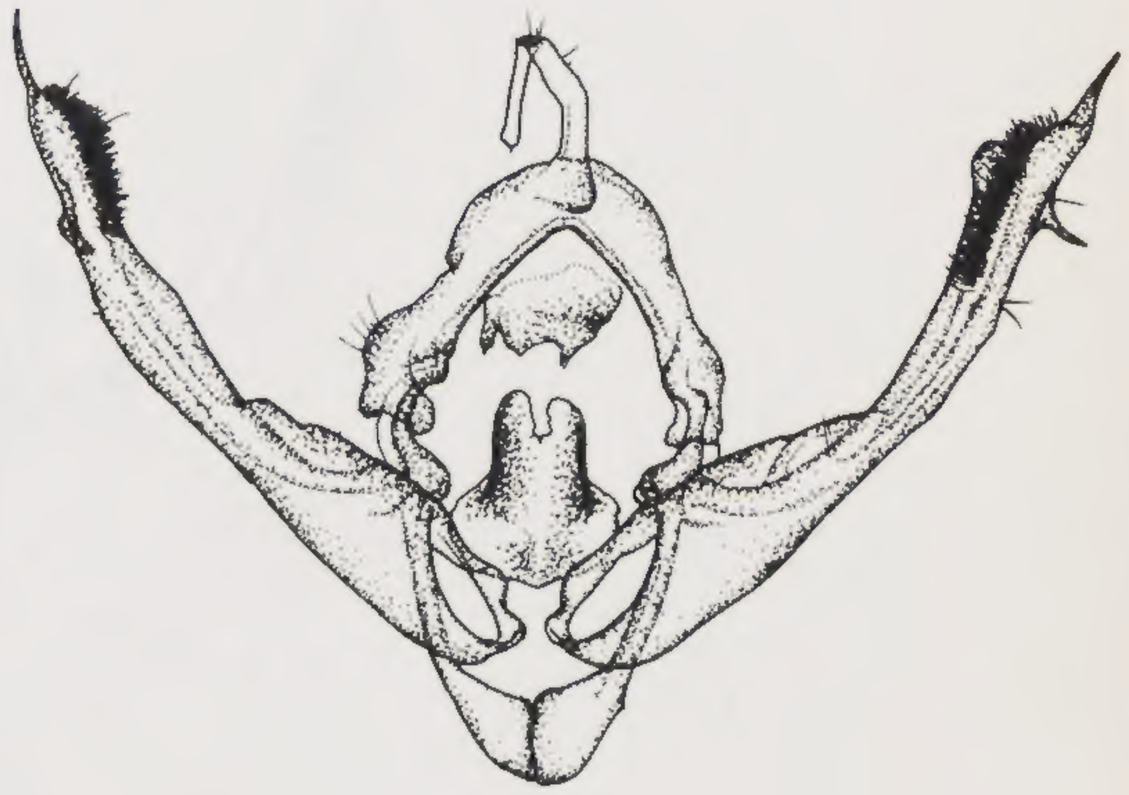
Figs. 24–30

24 *M. semitaria,* egg, Atsion, New Jersey
25 a, b *M. australis*, 2 eggs *ex* Paratype no. 82
26 *M. viatica,* egg, Hamden, Connecticut
27 *M. violacea,* egg *ex* Paratype no. 27
28 a, b *M. violacea*, newly hatched larva *ex* Paratype no. 27, dorsal (a) and lateral (b) views
29 *M. violacea*, pupa, sibling to Holotype (YPM). 2×.
30 *M. australis*, close-up of aberrant antenna of Paratype 10 (see also Fig. 3)

31 *M. australis*, ♂ genitalia with everted aedeagus, Paratype no. 75, slide DFS 7801 (YPM)



33 *M. viatica*, ♂ genitalia (without aedeagus), North Haven, Connecticut, 4 November 1959, *leg.* C. L. Remington, slide DFS 7614 (YPM)

32 Same, Paratype no. 78, slide DFS 7802 (YPM)

34 *M. viatica*, ♂ genitalia, with uneverted aedeagus, Strafford, Pennsylvania, 5 November 1966, *leg.* D. F. Schweitzer, slide DFS 7604 (YPM)

35 *M. violacea*, ♂ genitalia with everted aedeagus.
Holotype, slide DFS 7607 (YPM)

36 Same, Paratype no. 6, slide DFS 7605 (YPM)

37 Same, Paratype no. 353, slide DFS 7610 (YPM)

38 *M. violacea*, ♀ genitalia (virgin), Paratype no. 237, slide DFS 7611 (YPM). Note: most of the ridges on the bursa copulatrix are inconspicuous after mating.